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Arboviral Diseases in Indiana

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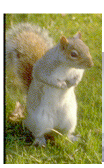
Arboviruses


Arthropod borne viruses, a.k.a. arboviruses are very diverse. Over 100 of these agents are currently recognized as pathogenic to humans. Others can also cause disease in plants. As the name implies, all are carried by biting arthropods such as ticks, mosquitoes, and other biting flies. Most of the human arboviruses, particularly those which cause problems in Indiana, are zoonotic diseases. They are transmitted by mosquitoes and are normally carried in natural vertebrate reservoirs such as wild birds and rodents.


LaCrosse Encephalitis Virus

LaCrosse Encephalitis virus (LAC), a member of the California Group of encephalitis viruses, is the only one of these viruses which is endemic to this geographic area and is known to be pathogenic to human beings. It is transmitted by *Aedes triseriatus*, the Northern Tree-hole Mosquito, which is found throughout the state breeding in natural containers such as water-holding cavities in trees. It has also adapted to taking advantage of containers provided by human beings and is commonly found in backyard sites such as discarded tires and clogged eaves troughs.




The normal reservoirs for the virus are the chipmunk and the squirrel, animals which once again are found throughout the state. The virus is transmitted from animal to animal by the treehole mosquito, but is also maintained in nature through a cycle involving transovarial transmission. Female mosquitoes will pass the virus through their ovaries to their progeny. The virus is then vertically transmitted through developmental stages until the next generation of adults becomes infected. Researchers believe that this cycle is utilized to maintain the virus in specific geographic locations, while immature chipmunks and squirrels serve as amplifying hosts.

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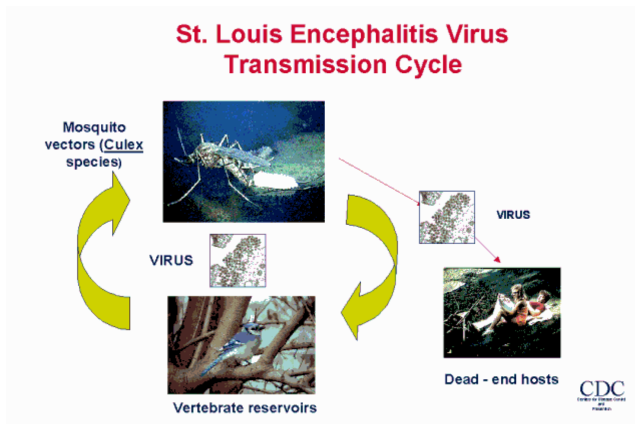
Human cases have a tendency to occur in clusters year after year in the same locations. Children under the age of 15 are most often severely affected. Clinical CNS infections in adults are rare.

Control of this virus is most efficiently accomplished through health education, informing the public of the need to discard containers in back yards, which can serve as breeding sites. Intervention by local health departments can often be necessary when clusters of several cases occur in a defined area such as a subdivision. In situations such as this, physically locating and plugging tree holes in addition to elimination of artificial containers is useful.

St. Louis Encephalitis Virus

St. Louis Encephalitis (SLE) virus is a flavivirus, which has historically significantly impacted human populations through periodic epidemics in the Midwest. Outbreaks have occurred in Indiana in 1955, 1964, 1975, and 1976. The largest of these occurred in 1975 when 323 cases and 17 deaths were confirmed throughout the state. While people of all ages are susceptible to infection, most severe clinical cases of SLE are seen in those people over the age of 55.



This virus is transmitted by *Culex pipiens*, the northern house mosquito. This mosquito is closely associated with human beings, breeding in large numbers in organically rich water such as septic effluent. It can also be found in artificial containers such as discarded tires, buckets, cans, unused wading pools, and in clogged eave troughs. It will also take advantage of accumulations of water in catch basins in urban areas. Two other mosquitoes, *Culex restuans* and *Culex salinarius* are found in similar habitats and can also be involved with transmission.

St. Louis Encephalitis virus is maintained in nature through a mosquito-wild bird cycle. Many species of wild birds are susceptible to infection and can play a role in amplification of the virus.

St. Louis Encephalitis, because of the scope of the area in which intense transmission can occur, and the wide variety of breeding sites used by the vector mosquitoes, most efficiently controlled by community-based control programs.

Eastern Equine Encephalitis

Eastern Equine Encephalitis (EEE) virus can cause severe illness not only in human beings, but also in horses. Emus are also susceptible.

This virus is transmitted in the enzootic phase of its cycle (bird-to-bird) by *Culiseta melanura*. This mosquito is found in Indiana in very specific habitats, closely associated with sphagnum bogs. Since these habitats are limited to the northern tier of Indiana counties, most cases of EEE are seen in that area.

The mortality rate among horses is 100%. Fortunately for the human population, when transmission does occur, many more horse cases than human infections are seen. While the mortality rate is not as high in humans, ranging from 40% to 60%, the course of infection is quite severe, often leaving the patient with permanent neurological damage. Severe cases are seen in patients of all ages.

The epizootic vector of the virus (from bird to human) is thought to be *Coquilletidia perturbans,* a mosquito found associated with cattails and other emergent aquatic vegetation in natural bodies of water. Once again, effective control of this virus due to its scope is best accomplished through community-wide control programs.

Arbovirus Surveillance

The outbreak of St. Louis Encephalitis in the Midwest in 1975 illustrated the need to conduct proactive surveillance for arboviruses, which can cause epidemic disease. Since these outbreaks have a tendency to occur toward the end of summer and early fall, very often by the time cases occur and can be serologically identified as to etiology, the epidemic will have already occurred. Control efforts can then be too late.

Since two of the aforementioned viruses, St. Louis Encephalitis and Eastern Equine Encephalitis Viruses, are normally amplified in the wild bird population, a surveillance program was initiated in Indiana in 1976 to monitor seroprevalence for antibodies in wild birds. Since this amplification needs to occur prior to an epizootic into the human or domestic horse populations, this can be detected and used as an early warning system. Preventive measures can then be taken to reduce numbers of human or horse cases.

The program in Indiana was first designed to detect impending outbreaks by viewing the worst of all situations. Sites were selected for continuous monitoring throughout the transmission season based upon several factors. The first was a history of problems with epidemic disease. Since several outbreaks of both SLE and EEE had occurred, historic data were available. Second, entomologists visited urban areas, conducted surveys, and added sites that contained significant breeding areas, thus providing the potential for future outbreaks. Third, a serological survey was conducted in 1979 in which 10,000 Hoosiers statewide were tested for antibodies to SLE and LAC. Based upon seroprevalence results from this survey, a number of counties were added from which clinical cases had not been reported; yet a high prevalence for antibodies to SLE was identified.

Thirty counties were selected as indicator areas for transmission. Currently, counties are sampled on either a weekly or biweekly basis. Teams of entomologists and summer interns using Japanese Mist Nets collect wild birds. The birds are banded, and a small sample (0.25 - 0.5 cc) of blood is drawn depending on the size of the bird. The bird is banded and then released.

The blood is centrifuged to separate serum from cells, then taken to the Indiana State Department of Health Immunology Laboratory. There, hemagglutination inhibition tests for SLE, EEE, and Western Equine Encephalitis (WEE) are run. (West Nile Virus has recently been added to this battery of tests.) Positive samples are then sent to the University of Notre Dame, where serum neutralization tests are conducted for confirmation. Since rapid turnover is critical, screening tests are conducted on all samples within one week of collection. Serum neutralization confirmation requires five days. This time frame is relatively rapid, and historically has served well in the detection of arbovirus transmission, allowing time to take measures for intervention prior to large outbreaks of human disease.

Reports of Perceived Cancer Clusters

Robert Teclaw, D.V.M., M.P.H., Ph.D.
ISDH Epidemiology Resource Center

Responding to a cancer cluster report from a citizen is one of the most poignant and frustrating duties of the Epidemiology Resource Center (ERC). Usually, the reporter or a close relative or friend has cancer, and those involved are angry and fearful. They suspect that something in the environment caused their cancer and that of several other people in their community. They want answers. The frustrating part is that we are often unable to provide satisfactory answers.

Here are some of the possible explanations for what appears to be a cancer cluster.

1. There is no excess of cases; it only seems that way.
2. There is an excess of cases, but it is due to chance.
3. There is an excess of cases due to a specific cause, but we can't determine what it is.
4. There is an excess of cases, and an environmental cause has been or can be determined.

Most of the cluster reports received at the ERC fall into the first category. Cancer is a very common disease; it will strike roughly one in three persons and three of four families. Once someone gets cancer, he or she begins to notice other cases. Suddenly, there seems to be more cases than there should be. By using data from the Indiana Cancer Registry, we are often able to show that the number of cancer cases occurring in the ZIP code or county in question is not above what would be expected. Sometimes this is reassuring to the reporter. Other times, the reporter remains convinced that an excess of cases exists (and even that a particular environmental toxin is the cause).

The second possible explanation, that the excess cases are due to chance or random variation, occurs much less frequently among reported clusters. Cancer is not evenly spread out within the populace but occurs more or less at random. Thus, it is expected that most communities would have near the average number of cases per 100,000 population, some would have an above average rate, and others would have a below average rate. Picture one thousand marbles randomly scattered on a floor consisting of one thousand tiles. You would be very surprised to find one marble on each tile. In fact, some tiles would have several marbles and others none. When people living in one of the communities with excess rates (equivalent to a tile with many marbles on it) become aware of the higher than expected number of cancer cases, they naturally suspect that something in the environment caused the cancers. The problem is that we actually expect some communities to have excess cancer rates by random variation or chance alone. When you live in one of those communities, however, the excess seems alarming. It is very difficult, especially with the small numbers of cases that we often deal with, to distinguish between chance excess and a true cancer cluster.

The third possible explanation occurs when we attribute an excess rate to chance but there is really an environmental cause. As noted in the previous paragraph, it is very difficult to distinguish between chance excess and a true cluster.

Finally, a reported cluster might, in fact, be real. In all of the thousands of studies of possible environmental sources of cancer clusters, the only one that showed an association between an environmental exposure and cancer was carried out in Woburn, Massachusetts and linked childhood leukemia and well water. Even in that case, no specific chemical of the possible candidates was identified as the likely cause of the leukemia. Such studies are extremely expensive and labor intensive. Given the low success rate of cancer cluster investigations, it is difficult to justify the expense of carrying out a cluster study unless there is strong preliminary evidence to suggest a meaningful outcome.

What are the characteristics of a cancer cluster due to environmental causes?

1. Cancers clusters should be of the same type. There are over 100 types of cancer. Each has its own set of causes and behaviors. We would usually not expect a single environmental substance to produce multiple cancer types.
2. Cancer develops over the course of many years. Therefore, we would expect that members of the alleged cluster have lived in the community long enough to have been exposed and to have time to develop cancer.
3. Ideally, there should be a candidate substance or substances that is a plausible cause of the cancer type observed. It is very expensive to test for all chemicals that might be implicated.
4. There must be a pathway for the alleged environmental cause to expose people. For example, groundwater pollution would be an unlikely cause of a cluster if the community is served by a municipal water system, especially if the cluster occurs in a subsection of the water system service area.
5. There will be a sufficient number of cases to permit statistical analysis of the data. Only the strongest associations between a carcinogen and cancer cases can be detected with limited data. Most cancer cluster investigations are not fruitful because there is no effect, the effect is subtle, and/or the number of cases is too small to detect the effect.

What then should be the public health response to a cancer cluster report?

In spite of the fact that most cancers are caused by “life style” choices -- less than 10% of human cancers are due to environmental pollution while tobacco and obesity account for about 30% each -- and that investigations of alleged cancer clusters have not been fruitful in the past, requests for help can not be ignored. At the very least, we should attempt to determine if an excess cancer rate really exists for the community in question. Demonstrating the absence of excess cancer cases should reassure reporters that their fears are most likely unwarranted. On the other hand, cluster reports could reflect a dangerous public health problem and should be evaluated sufficiently to rule out a cluster or to determine that not enough information is available to establish the cause of the cluster. The Indiana State Department of Health will be revising its cluster response protocol in 2001 in order to take advantage of new data and methodologies such as geographic information systems (GIS). Our goal is to establish a balance between giving cancer cluster reports the attention they deserve and using scarce resources most efficiently.

International Travel….More than a Passport

Shawn Richards, BS
ISDH Communicable Disease

Preparing for international travel is more than getting a passport, receiving travel vaccinations, and making airplane reservations. Destinations and related health issues, along with personal safety, vary widely and need to be considered on an individual basis.

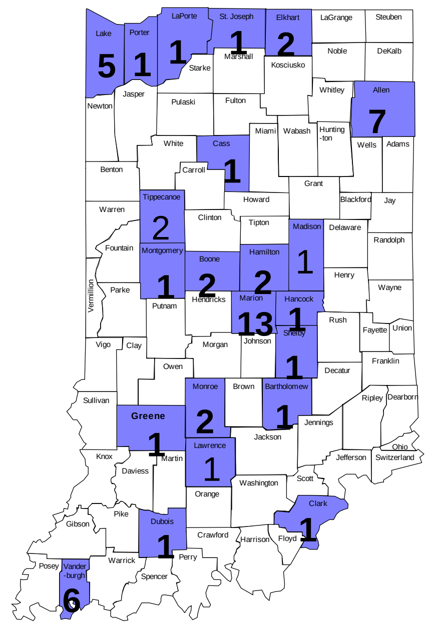
The Indiana State Department of Health (ISDH) wants Hoosiers who travel to have a healthy and safe international experience. Healthcare providers or international travel centers are the best resources for discussing international travel immunizations. They will either have access to a medical history or will ask appropriate medical history questions and will advise on necessary immunizations for travel destination. A list of international travel centers is located on the ISDH new international travel web site at: www.statehealth.IN.gov/healthinfo/yellowfever.htm.

In 2000, Indiana international travel centers administered 2,973 yellow fever vaccinations, a 35% increase from 1999. This may be due to increased adoption interests, global business opportunities, religious mission interests, or an increased interest in those particular locations where the yellow fever is required. In conjunction with the increased number of yellow fever vaccinations and a dramatic increase of telephone calls, ISDH has enhanced its international travel program. We have devised a user-friendly website for health care providers and for Indiana's citizens.

The international travel web site is located at: www.statehealth.IN.gov (click on Health Information). This site contains many resources for both health care providers and Hoosiers to make informed decisions before stepping foot on foreign soil. Some of the highlights on the site are:

- Centers for Disease Control and Prevention (CDC) vaccination recommendations for international travel
- A downloadable international travel preplanning worksheet
- Names, counties, addresses, and telephone numbers of Indiana international travel centers
- Links to federal sites containing travel warnings and consular information sheets

Distribution of 2001 Yellow Fever / Travel Centers



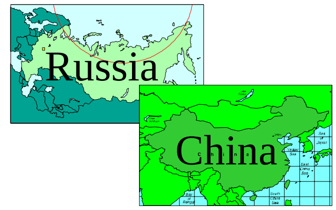
International travel medicine is very complex and a travel consultation may prevent unnecessary illness or disease. Health care providers need to consider medical history, travel plans, and information from the CDC before making any travel immunization recommendations. Given the complexity of international travel, the ISDH does not give travel vaccination consultations, and requests that health care providers not refer patients to the agency for a list of immunizations prior to travel. Health care providers who are not familiar with international travel immunizations, or are not able to obtain recommended vaccinations, should refer their patients to an international travel center mentioned on the above web site. Patients who are referred to an international travel center need to provide their primary health care provider with their new immunization status after their international travel immunizations are received.

Ideally, immunizations for travel should begin 6 months prior to travel. However, 4-6 weeks is generally adequate time for vaccines to be effective. Travelers should be directed to contact their health insurance companies prior to their travel consultation, since most insurance companies do not cover travel vaccinations. Additionally, most health insurance coverage and some credit cards are not valid outside of the United States and cash will be demanded before medical services are rendered. Medicare and Medicaid are a few examples of insurance plans that are not valid outside of the United States.

Usually, illnesses and disease from international travel will manifest within 8 weeks after returning to the U.S. However, some infections may remain latent in the body for several months. Travelers should immediately notify their health care provider of any flu- or cold-like symptoms for up to a year after return from a foreign country. The health care provider should be reminded when and where the traveler visited. Many illnesses are ignored or disregarded as influenza or gastroenteritis when, in fact, they are infections related to their travel.

International Travel Results in Four Recent Measles Cases in Indiana

Wayne Staggs, MS
ISDH Epidemiology Resource Center



Recent travel to China and Russia by parents adopting foreign children has resulted in four cases of measles in Indiana this year.

In late February, two prospective mothers traveled to China to adopt babies. In one instance, the mother returned to Indiana from the orphanage in China with her baby, and the mother, 44 years of age, developed a rash on March 3. Her illness was later serologically confirmed as measles. In another case involving the same Chinese orphanage, the mother and her baby, who was 10 months old, returned to Indiana. The baby had a rash onset of February 26 and was serologically confirmed as a measles case. It was learned that the orphanage from which these cases originated had an ongoing measles outbreak, which resulted in at least 14 cases in the United States during February and March of this year.

In another incident, a mother travelling to Russia adopted two children and returned to Indiana on April 3. One of the children, an eight-month old baby, developed a rash on April 2. The mother, 38 years of age, developed a rash on April 14. The Indiana State Department of Health Laboratory serologically confirmed both the mother and child as positive for measles.

These cases reinforce the need for international travelers to be immune to measles prior to leaving the United States. In recent years, almost all cases of measles reported in the U.S. can be traced directly or indirectly to foreign travel or contact with foreign visitors. Only six measles cases were reported in Indiana during the period from 1994-2000. All six cases were directly linked to foreign exposure from the following countries: Zimbabwe (3), Japan (1), England (1), and the Philippine Islands (1).

Vaccination recommendations and other traveler's health information can be found on the Centers for Disease Control and Prevention web site at www.cdc.gov/travel. Specific recommendations for measles vaccination are as follows:

1. For travelers two years and older, at least one dose of MMR vaccine given on or after 12 months of age is recommended. Persons born in or after 1957 should consider a second dose of measles vaccine before traveling abroad.

2. For travelers less than two years of age, one dose of MMR vaccine is recommended. Measles vaccine or MMR may be given to infants 6-11 months of age who are going to areas of high risk for measles. Infants vaccinated before 12 months of age must be revaccinated on or after the first birthday with two doses of MMR vaccine separated by at least 28 days. Infants less than 6 months of age are usually protected by maternally derived antibodies.

Wonderful Wide Web Sites

ISDH Data Reports Available

The ISDH Epidemiology Resource Center has the following data reports and the Indiana Epidemiology Newsletter available on the ISDH Web Page:

http://www.statehealth.IN.gov (under Data and Statistics)

Indiana Cancer Incidence Report (1990, 95)

Indiana Cancer Mortality Report (1990-94, 1992-96)

Indiana Health Behavior Risk Factors (1995-96, 97, 98)

Indiana Hospital Consumer Guide (1996)

Indiana Marriage Report (1995, 96, 97)

Indiana Mortality Report (1995, 97)

Indiana Natality Report (1995, 96, 97)

Indiana Natality/Induced Termination of Pregnancy/Marriage Report (1998)

Indiana Report of Diseases of Public Health Interest (1997, 98, 99)

The following site allows access to the web page for any state health department in the United States:

http://www.polsci.wvu.edu/grad/klase/STATEHEALTH/sthlth.html

HIV Disease Summary

Information as of April 30, 2001 (population 5,840,528)

HIV - without AIDS to date:

307	New cases from May 2000 thru April 2001	12-month incidence	5.26 cases/100,000
3,336	Total HIV-positive, without AIDS on April 30, 2001[1]	Point prevalence	57.12 cases/100,000[1]

AIDS cases to date:

319	New AIDS cases from May 2000 thru April 2001	12-month incidence	5.46 cases/100,000
2,703	Total AIDS cases on April 30, 2001[1]	Point prevalence	46.28 cases/100,000[1]
6,168	Total AIDS cases, cumulative (alive and dead)		

[1]Counting only cases alive in April 2001

REPORTED CASES of selected notifiable diseases

Disease	Cases Reported in April *MMWR* Weeks 14-17		Cumulative Cases Reported January - April *MMWR* Weeks 1-17	
	2000	2001	2000	2001
Campylobacteriosis	21	15	65	68
Chlamydia	1,050	1,063	4,320	5,126
E. coli O157:H7	8	3	10	12
Hepatitis A	5	7	15	29
Hepatitis B	10	2	15	6
Invasive Drug Resistant *S. pneumoniae* (DRSP)	21	33	88	93
Gonorrhea	489	401	1,961	2,092
Legionellosis	2	1	9	5
Lyme Disease	0	0	0	0
Meningococcal, invasive	2	10	18	12
Pertussis	4	6	12	11
Rocky Mountain Spotted Fever	0	0	0	1
Salmonellosis	47	35	123	93
Shigellosis	62	18	124	83
Syphilis (Primary and Secondary)	39	11	149	55
Tuberculosis	10	7	46	28
Animal Rabies	0	0	0	1 (Bat)

For information on reporting of communicable diseases in Indiana, call the *ISDH Communicable Disease Division* at (317) 233-7665.

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